Center for Independent Experts (CIE) review report on the 2013 STAR Shortspine and Longspine Thornyheads Stock Assessments

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Prepared for

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Contents

Executive Summary

The 2013 assessments of stocks of shortspine thornyhead (*Sebastolobus alascanus*) and longspine thornyhead (*Sebastolobus altivelis*) along the US Pacific Coast, were reviewed by a Stock Assessment Review (STAR) Panel. The STAR Panel met at the Northwest Fisheries Science Center, Seattle, WA, from July 22 - 26, 2013. The assessments of the stock done by the stock assessment team (STAT) (composed of stock assessment scientists from the Northwest Fisheries Science Center) were presented to the STAR Panel. The validity of the data, biological and geographical characteristics, assessment procedures, and results were discussed. The Panel operated under the U.S. Pacific Fishery Management Council's Terms of Reference (ToR) for the Groundfish and Coastal Pelagic Species Stock Assessment and Review Process for 2013-2014 (PFMC 2012).

The review aims to evaluate the modification/progress of the stock assessment models illustrated in the draft reports compared with the 2005 stock assessments, and to ensure that the Pacific Fishery Management Council (PFMC) bases its decisions on the best available information when managing these two long lived species, including providing a scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The NWFSC provided all the necessary logistic support, background information, documents, and further data and model exploration that were requested by the review panel. The STAR Panel chair, Dr. Meisha Key, assigned reporting duties to each of the STAR panel members before the meeting. She then led the STAR Panel report and communicated the draft report with the STAT panel members, the STAR Advisory Panel, and other attendees before the end of the meeting, to avoid possible confusion. The STAR Panel Report was then finalized after the meeting. Center for Independent Experts (CIE) members then prepared their individual reviews.

The last stock assessment for shortspine thornyhead was done in 2005 (Hamel 2005). A benchmark assessment for this species with several sensitivity runs was presented by Drs. Ian Taylor and Andi Stephens on July 22. The draft stock assessment was well prepared with a short review on historical stock assessments and changes in the newly development stock assessment. However, the STAT team stated that there was a mis-specification in the selectivity parameters in the original base model, so the results from the presentations were different from those in the draft report. The new stock assessment divided both the trawl and non-trawl fisheries into north and south fisheries, changed the maturity curve based on the new NWFSC shelf/slope survey, revised the natural mortality rate and the steepness h, re-stratified the AFSC triennial survey and estimated catchability of the NWFSC shelf/slope survey instead of fixing it. The new benchmark assessment was discussed with 5 runs of requests from the STAR panel. The recommended base model was further modified and included: a fixed M of 0.0505, a fixed h of 0.6, removal of the Pikitch data for the south trawl discarding data, removal of 1980 and 1983 length composition data from the triennial survey and removal of the trawl north length composition for 1994-1995, and a change in the time blocks of the retention curves. Overall, the suggested revisions during the review are not minor. I put details and rationales for these suggestions in the TORs. The models included in

the draft stock assessment report and those done during the review were solved using the Stock Synthesis platform version 3.24q.

The STAR panel requested a list of questions to explore the influence and rationale of using historical catch data, different maturity curves and different retention time blocks for shortspine thornyhead. Quite some time was spent to explore the approaches to estimate the relative abundance index from the triennial survey and the application of SS3.24p also. Additionally, the STAR panel requested the likelihood profiles given different natural mortality, stock-recruitment steepness values and the $Ln(R_0)$ to understand the influence of using the fixed value of h and M, and the rationale of using which key parameter to develop the decision table.

The shortspine thornyhead assessment was considered to be based on the best available data, and constitutes the best available information on this species along the U.S. West Coast. Some key recommendations for shortspine thornyhead assessment are summarized below:

- Continue the effort on the maturity studies. The STAR panel recommended that Pearson and Gunderson (2003) continue to be used in this stock assessment instead of the newly analyzed maturity curves. However, research on the causes of the differences in the two studies should be valuable for future stock assessment.
- Continue the effort on the historical catch reconstruction analysis. The STAR panel recommended that the pre-1981 data used in Hamel (2005) continue to be used in this stock assessment but further exploration on the reconstructed catch history is needed.
- Investigate the estimation method for the AFSC triennial survey relative abundance index. Although the STAR panel suggested that the early – late stratification used in Hamel (2005) be used continuously because of time limitation, further studies with results that can be used to validate the proposed approach is suggested in the future.
- Influence of fixing growth parameters may be explored by releasing some of them consequently as alternative sensitivity runs. Because of lacking age data, the growth curve used influences the results substantially as shown in the longspine thornyhead stock assessment.
- Species identification and life history information such as maturity, fecundity and growth functions need to be compared across its distribution area in the future.
- Continue the effort on a full Bayesian analysis. The STAR panel talked about Bayesian MCMC results but did not recommend reviewing these results because of limited time. More effort on this approach is encouraged in the future. The Bayesian results should be readily used in a decision table (Punt 1997), to avoid the difficulty in quantifying the state of nature in the decision table.
- The stock assessment results were very sensitive to small changes in both data and parameterization.
    - The STAT team may need more time to prepare the stock assessment to avoid unstable results done in a hurry during the review week.

    - The STAT team may also consider simpler methods that may provide relatively robust advice.
    - Studies on catchability may be further developed from both the field experiment studies and modeling prior elicitations. The current biomass estimate is too sensitive to small changes in model structure, and data weighting alternatives.
- A more detailed description of model equations, symbols used in the equations, submodels used in different scenarios, and the priors used should be provided in future reports. It should help understand the data used, model structure and uncertainty considered in a much better way.

A benchmark assessment was also conducted and presented for longspine thornyhead by the STAT team, Drs. Andi Stephens and Ian Taylor, on July 23. Longspine thornyhead was last assessed in 2005 (Fay 2005). The newly provided benchmark assessment in the draft report used almost the same model structure as used in the last stock assessment. Some modifications were suggested during the review. These modifications included (1) estimate growth parameters and uncertainty of growth curve, (2) change the selectivity function, and (3) restructure the retention time blocks to reflect the fishery history. The STAR panel discussion and requests focused on better understanding the selectivity curves, growth curves and retention changes over time, and their influences on the stock assessment results. The base model estimate for 2013 spawning depletion (SSB_{2013}/SSB_0) is 75%. Both the STAT and STAR panel members agreed that these changes improved the assessment.

The longspine thornyhead assessment done by STAT was considered to be the best scientific information and adequate for evaluating stock status. Some key recommendations for longspine thornyhead assessment are summarized below:

- Evaluate the influence of the fixed parameters by providing a likelihood profile for these parameters given different values, or releasing some of the fixed parameters step by step to investigate the influence of fixing/releasing them.
- Ageing method validation and further otolith reading on both the historically collected data and future survey data are suggested.
- Uncertainty of the historical catch was one of the major uncertainties discussed during the review. Beyond continued effort on historical data reconstruction /synthesis, incorporating uncertainty of catch in the model should probably be explored.
- The stock assessment results were very sensitive to small changes in both data and parameterization.
    - The STAT team may need more time to prepare the stock assessment to avoid unstable results done in a hurry without intensive jittering for example, during the review week.
    - The STAT may also consider simpler methods that may provide relatively robust advice.
    - Studies on catchability may be further developed from both the field experiment studies and modeling prior elicitations. The current biomass

estimate is too sensitive to small changes in model structure and data weighting alternatives.

- A more detailed description on model equations, symbols used in the equations, submodels used in different scenarios, and the priors used should be provided in future reports.

1. BACKGROUND

This report reviews the 2013 stock assessments of shortspine and longspine thornyheads off the Pacific Coast under contract to the Center for Independent Experts (CIE). I was provided with draft stock assessment reports and web access to relevant files and documents (Appendix 1) and participated in the Stock Assessment Review (STAR) Meeting. Extra documents were provided during the review upon request from the CIE peer review panel (Appendix 1).

The last assessments for both species were in 2005, and there have been multiple modifications and developments in their assessment methodologies since then. The newly developed stock assessments will provide the basis for the management of these two species off the Pacific Coast.

The review committee was composed of Drs. Meisha Key (Chair), Jean Jacques Maquire, Yan Jiao, and Ray Conser. The review was assisted by Drs. Stacey Miller, Jim Hastie, and John DeVore. The shortspine thornyhead stock assessment report was prepared and was presented at the meeting by Drs. Ian Taylor and Andi Stephens; the longspine thornyhead stock assessment report was prepared and was presented at the meeting by Drs. Andi Stephens and Ian Taylor.

2. REVIEW ACTIVITIES

The STAR Panel meeting took place at the Northwest Fisheries Science Center, Seattle, WA, from July 22 – 26, 2013. The meeting followed the "tentative agenda" of the STAR review (Appendix 4). The meeting was open to public and was attended by observers, including members of the fishing industry.

About two weeks before the meeting, assessment documents and supporting materials were made available to the review panel via emails and an ftp website. On the morning of July 22 before the meeting, the assessment review committee met with the STAT team to discuss the meeting agenda, reporting requirements, and meeting logistics. Dr. Jim Hastie welcomed everyone to the meeting. Dr. Meisha Key (chair of the STAR panel) reviewed the Terms of Reference for Assessment and Review Panel, and tasks/components of the STAR panel report, and assigned reporting duties to each of the STAR members. During the STAR meeting, all documents, including extra documents requested during the review, were made available electronically through an ftp site (Appendix 1).

The draft assessments of these two species were presented by the STAT team to the Panel and other attendees, and the input data, models, parameter estimates, fishery and population status were evaluated through open discussion. The STAT members were always available when required for further discussion, for additional model runs for clarification, and for clarification of how the STAR ToRs were addressed. The ToRs for each species/stock were reviewed to ensure they had been fully addressed. A conclusion was then drawn on which model to recommend, which data scenario to use

as the base scenario, and whether to accept the assessment as a basis for management of this fishery.

3. ROLE OF INDIVIDUAL REVIEWER

My role as a CIE independent reviewer was to conduct an impartial and independent peer review in accordance with the SoW and the predefined ToRs (Appendix 2) herein. I reviewed reports and related documents provided by the STAR meeting coordinator before the review meeting, and reviewed the presentations and report and participated in the discussion on these documents/presentations during the panel review week. During the review, I helped the STAR panel to organize and prepare the Panel report. After the peer review meeting, I summarized the findings and recommendations according to the predefined ToRs. This review report is formatted according to my interpretation of the required format and content described in Annex 1 of Appendix 2.

4. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS IN ACCORDANCE WITH THE TERMS OF REFERENCES

I participated in the Panel review meeting to conduct independent peer reviews of the assessments of shortspine thornyhead and longspine thornyhead managed by the Pacific Fishery Management Council. Below I provide the summary of findings of each ToR for each species reviewed in which the weaknesses and strengths are described and conclusions and recommendations are presented in accordance with the ToRs.

4.1. Shortspine thornyhead

4.1.1 *ToR 1* – Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g., previous assessments and STAR panel report when available) prior to review panel meeting.

I reviewed reports and related documents provided by the STAR meeting coordinator before the review meeting, which mainly included the draft STAT stock assessment report, historical stock assessment reports, the last STAR panel report, the ToRs and the supporting documents on data syntheses, prior elicitations, and the Stock Synthesis technical document and user manual.

4.1.2 *ToR 2* – Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.

The newly developed maturity curve for shortspine thornyhead is very different from commonly seen maturity curves and the maturity curve (Pearson and Gunderson, 2003) used in the Hamel (2005) stock assessment. After intensive discussion on this question, the STAR suggested that the maturity curve developed from Pearson and Gunderson (2003) continuously used in this stock

assessment with a sensitivity run on the newly developed maturity function. The reasons for this recommendation are based on the reality that Shortspine thornyheads spawn from December to May. Pearson and Gunderson (2003) collected samples from the Aleutians to Pt. Conception from a wide variety of depths during February to June, whereas the new function presented was from the NWFSC shelf/slope survey collected during May to October.

Uncertainty about the catch history was discussed in the draft document and during the review. The historical catch of shortspine thornyhead is uncertain prior to 1981 when PacFIN database was started. The STAT used the historical catch time series from the Hamel (2005) assessment rather than the reconstructed catches in CA and OR since they could not reconcile the two conflicting catch streams. A few sensitivity runs were requested and provided. Although the estimated SSB is less sensitive to these earlier catches, continued effort to investigate the historical catch reconstruction is still helpful in improving the stock assessment.

Two types of stratification on the triennial survey were presented. One is based on the two time blocks approach (1980-1992; 1995-2004), which has been widely used for many species. The STAT team provided a new triennial survey stratification by depth rather than an early and late stratification. The deeper stratification used the entire time series (excluding 1977, i.e., 1980-2004) and the shallower stratification used the later time series (1995-2004) since the latitudinal coverage changed early and late in the survey. There was discussion relative to sensitivity analyses for these stratification decisions, which were not presented in the initial draft of the assessment. A few sensitivity runs were requested and presented. Because both the indices and the length compositions were compiled according to the stratification approaches, the model results, such as SSBs were very sensitive to the stratification approaches. The STAR panel recommended using the two time blocks approach as used in the 2005 stock assessment. This recommendation is based on the reality that there were not enough materials provided to judge the new approach, and the overall time for this review is limited.

A few datasets were suggested not to be used in the base model and they included: the Pikitch discard data for the south trawl fishery because of the small sample size and it did not cover the area from the fishery, the length composition data in 1980 and 1983 from the AFSC triennial survey, and the length composition data for 1994-1995 from the north trawl fleet which have very unusual patterns and were thought to be outliers.

There are no age data in the stock assessment model. Future investigation of ageing methods and extra age information should help improve the stock assessment.

4.1.3 *ToR 3* – Evaluate model assumptions, estimates, and major sources of uncertainty.

The stratification of the surveys influences not only the relative abundance index but also influences the length composition from these surveys, as showed in the ASFC triennial surveys. I consider this as one of the major sources of uncertainty, and it should be further explored.

A fixed stock-recruit steepness, h, was used in the base model. There were intensive discussions on whether the mean of the prior based on Thorson (2013) should be used. Given the reality that thornyheads are not rockfishes the STAR suggested that h=0.6 used in the 2005 stock assessment be continuously used. The natural mortality rate was further updated based on the mean of the prior developed from Hamel (2013). Different values of these two parameters have a dramatic influence on the stock assessment results. I considered this as one major source of uncertainty in estimating the fishery and stock status.

The catch is assumed to be deterministic without uncertainty but at the same time the pre-1981 historical catch was one of the major uncertainties discussed during the review. So, beyond continued effort on historical data reconstruction/ synthesis, measuring and incorporating uncertainty of catch in the model should probably to be explored.

Estimation uncertainty seems high for this stock because the scale of the population size changed dramatically with limited changes on the model or data structure. This could be because of a lack of intensive jittering in a short while. At the same time, it could be because the overall scale of the population size is less estimable.

The current axis on the decision table is based on $\ln(R_0)$. Both natural mortality and steepness are also of high uncertainty. The current decision analysis is not enough to indicate states of nature, but the STAR panel cannot provide better suggestions given the current estimation algorithm (likelihood based). A full Bayesian analysis would make this step much easier and more scientific.

4.1.4 *ToR 4* – Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.

The stratification of the surveys not only influences the relative abundance index but also influences the length composition data compilation. Relative abundance indices and length compositions from different strata can be compared so that the influence from the stratification can be identified. This may help justify the estimated selectivity given different stratification also.

Uncertainty of the historical catch is one of the major uncertainties for many species along the Pacific Coast. For shortspine thornyhead, some sensitivity

runs with a reasonable level of uncertainty on historical catch may help. In addition to continued effort on historical data reconstruction/synthesis, incorporating uncertainty of catch in the model should probably be explored instead of assuming no error in the model.

Studies on catchability may be further developed from both the field experiment studies and modeling prior elicitations. This should help improve the robustness of the model results, such as the scale of SSB.

I suggest that continued effort should be spent on the development of a full Bayesian analysis given my concerns in ToRs. The results from such an analysis should be readily used in a decision table and uncertainty considered is based on all sources of the uncertainty involved in the model instead of only on natural mortality or steepness. Informative priors on key life history or fishery related parameters can also be incorporated in such an analysis.

4.1.5 *ToR 5* – Determine whether the science reviewed is considered to be the best scientific information available.

I consider the assessment represents the best scientific information available for the stock assessment of shortspine thornyhead although improvements or adjustments in model structure development are possible. The conclusion on the stock status is very robust to different data and model scenarios. However, because the estimated SSB is very sensitive to the data scenarios and the retrospective error is significant, consideration of using this assessment to provide the basis for the management of this fishery needs to be more precautionary.

4.1.6 *ToR 6* – When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

Suggestions for short-term improvement include 1) compare relative density and length compositions across strata or spatial areas, 2) collect new life history data, including maturity data, across space and time (a couple of years here) if possible to validate the functions, 3) explore the real application of Bayesian GLMM with stratification approaches compared quantitatively by providing more results that can be used to validate the stratification, 4) continue the effort on catch data reconstruction and update, 5) explore other ageing methods and continue the effort in ageing the existing datasets and future data, and 6) explore the alternatives with growth parameters not fixed.

Suggestions for long-term improvement include 1) develop a simulation study to explore the estimability of growth parameters and natural mortality including the

possible confounding relationship between them and with other key parameters such as catchability and selectivity, 2) develop a full Bayesian analysis and explore the differences of the results between maximum posterior likelihood estimation and the MCMC outputs for this species, and 3) investigate the possible approaches to increase model stability/robustness by considering simpler models that may provide relatively robust advice and studies on catchability that may be further developed from both the field experiment studies and modeling prior elicitations.

4.1.7 *ToR 7* – Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

The STAR Panel meeting took place at the Northwest Fisheries Science Center, Seattle, WA, from July 22 – 26, 2013. The meeting followed the "tentative agenda" of the STAR review (Appendix 4) with some flexibility on the time for each species.

On the morning of July 22 before the meeting, the STAR panel met with the STAT team to discuss the meeting agenda, reporting requirements, and meeting logistics. Dr. Meisha Key (chair of the STAR panel) reviewed the Terms of Reference for Assessment and Review Panel, and tasks/components of the STAR panel report, and assigned reporting duties to each of the STAR members.

Dr. Key also requested to post online all the presentations, the updated presentations, requests from the STAR panel, and the responses from STAT teams. Dr. John DeVore and the STAT teams posted all the materials from both the STAT and the STAR panels.

The STAT team for shortspine thornyhead stock assessment then started their presentations on the draft stock assessment. The presentation and discussion extended for the entire day. During their presentations, questions were asked from the STAR instead of waiting until the end of the presentation. The presentation was prepared according to biological and geographic characteristics of shortspine thornyhead, data and model structure, base case and sensitivity runs, and then model results. Because there was a mis-specification of selectivity parameter in the draft report, comparison with the revised model run was presented and discussed throughout the first day meeting. Questions were asked throughout the presentations by the STAR panel. In total, five runs of requests on this stock assessment were given by the STAR panel. Because this stock assessment was presented first, and there are similarities between the two stock assessments, time on this stock assessment was relatively longer than on longspine thornyhead. The request from the STAR panel and the responses from the STAT team can be found from the STAR panel report. I list the major pertinent discussions and recommendations below.

Questions on the unusual maturity pattern based on the new data from the NWFSC shelf/slope data:

Why are the two maturity curves between the new one and the one from Pearson and Gunderson (2003) used in the Hamel (2005) stock assessment so different?

The discussion on this issue was very useful. After intensive discussion on this question, the STAR suggested that the maturity function developed from Pearson and Gunderson (2003) be used in this stock assessment with a sensitivity run on the newly developed maturity function. Shortspine thornyheads spawn from December to May. Pearson and Gunderson (2003) collected samples from the Aleutians to Pt. Conception from a wide variety of depths during February to June, whereas the new function presented was from the NWFSC shelf/slope survey collected during May to October. So the data from Pearson and Gunderson (2003) should reflect the maturity better.

Questions on the stratification of AFSC triennial survey:

Two types of stratification on the triennial survey were presented as explained in TOR2. The model results were sensitive to the stratification. Because of time limitation, the STAR panel suggested that the stratification used in Hamel (2005) be continuously used in this stock assessment. The discussion on this issue was very useful, but the problem was not solved. Future exploration on the length composition changes across strata and spatial areas may be provided.

Questions on unusual catch history of the pre-1981 reconstructed catch:

Uncertainty about the catch history was discussed in the draft document and during the review. The historical catch of shortspine thornyhead is uncertain prior to 1981 when the PacFIN database was started. The STAT used the historical catch time series from the Hamel (2005) assessment rather than the reconstructed catches in CA and OR since they could not reconcile the two conflicting catch streams. The STAR requested a comparison between the catch time series used in Hamel (2005) and the reconstructed catch history. The extremely low catches in early years in the reconstructed catch is hard to explain, so that both the STAR and STAT agreed to continue to use the pre-1981 catch time series used in Hamel (2005). However, STAR also suggested that further exploration on the reconstructed catch is needed.

Questions on the appropriateness to use length composition data and discard data with low sample size or other datasets that are apparently outliers:

The discussion on this issue was very useful. Both STAR and STAT quickly agreed that the following data should be removed from the base case model

after sensitivity runs: the Pikitch discard data for the south trawl fishery because of the small sample size and it did not cover the area from the fishery; the length composition data in 1980 and 1983 from the AFSC triennial survey; the length composition data for 1994-1995 from the north trawl fleet which have very unusual patterns and were thought to be outliers. These data were all of poor quality and have limited influence on the stock assessment results.

Questions on the starting year of recruitment deviation: is recruitment deviation needed to be estimated from 1860 given the reality that catch before 1960s was so limited?

The STAT team provided one sensitivity run with the recruitment deviation from1930 because of the requests from STAR. The model results were not sensitive to this alternation. Both the STAR and STAT agreed to maintain the full time series in the base case.

On July 22, STAR panel member Dr. Meisha Key questioned the time blocks used in the time varying retention curves. Based on the advice from the GAP and GMT, another two suggestions were provided and two sensitivity runs were requested by STAR. After intensive comparison with both model goodness-of-fit and the historical fishery reality, the new time blocks agreed upon by both the STAT and STAR and adopted in the new base case model are: trawl north: 1901-2006, 2007-2010, from 2011; trawl south: 1901 to 2006, 2007-2010, from 2011; non-trawl north: no blocks; non-trawl south: 1901 to 2006, from 2007.

Extra explorations and discussions on model fitting include fit to the observation data of length composition and relative abundance indices, Pearson residual plot for length composition, likelihood from each dataset given different sensitivity runs, jittering and likelihood profiles. The exploration and discussion went very well and I found them to be useful and to contribute to the overall successfulness of the stock assessment review.

There were two runs of requests from July 25 and 26 on the approaches to quantify the uncertain state of nature in the decision table. Because the model output was based on a likelihood paradigm, and both natural mortality and steepness were fixed, the likelihood profile given different Ms were flat. The first run suggested is as below: take the 12.5% quantile in 2013 spawning biomass from base model; calculate the approximate R_0 value associated with it to get the low state of nature; determine the change in likelihood at this alternative R_0 value; add that change in likelihood to the base model to determine the upper R_0 value from the likelihood profile to get the high state of nature. It was not agreed by the STAR panel because the high state is way too high because of the flat shape of the likelihood profile of $Ln(R_0)$. So the second suggestion which is adopted in the decision table is to take the 12.5% quantile in 2013 spawning biomass estimate from the base model as the low state of nature; look for the

model that represents a change in likelihood of 1.2 units to represent the high state of nature. I personally strongly recommend a full Bayesian analysis to address the state of nature in the decision table.

4.2. Longspine thornyhead

4.2.1 *ToR 1* – Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.

I reviewed reports and related documents provided by the STAR meeting coordinator before the review meeting, which mainly included the draft STAT stock assessment report, historical stock assessment reports, the ToRs and the supporting documents on data syntheses or prior elicitations. The STAT draft report was well prepared, and included well-organized sections on historical stock assessments, and the changes made in both data syntheses and model construction in this stock assessment. These were very helpful in preparing the review.

4.2.2 *ToR 2* – Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.

The STAR panel discussion and requests focused primarily on better understanding the details of the growth curve used in the model, fishery and survey selectivities modelled and estimated, historical catch time series, the time blocks to define the time varying retention curves, and the axis of uncertainty for the decision table. Both the STAT and STAR panel members agreed that the changes made to the base model during the review improved the assessment.

The variability in growth rate for males and females were different in the draft report and presentation, but they were assumed to be the same. The STAR also realized that the growth of longspine seemed obvious even after age 40. So, the STAT team released the fixed k by estimating it based on the suggestions from the STAR. The modification to the model improved the model fit dramatically.

The original base model estimated the selectivity by assuming the selectivity patterns to be double normal and then fixed some of the parameters if they hit the bound or tended to be asymptotic. The STAR panel suggested that logistic selectivity functions for two surveys and fishery be used as a sensitivity run (keep double normal for AFSC slope survey). The selectivities changed from the original base case and the catchabilities for the surveys decreased. The STAR and STAT agreed with the change in the selectivity functions for the NWFSC surveys and the fishery and adopted this revision in the new base case.

Uncertainty about the catch history was discussed in the draft document and during the review. The historical catch of longspine thornyhead is uncertain prior to 1981 when PacFIN database was started. The STAT used the historical catch time series from the Fay (2005) assessment rather than the reconstructed catches in CA and OR since they could not reconcile the two conflicting catch streams. A few sensitivity runs were requested and provided. The reconstructed catch in late 1960s and 1970s were much lower than that in Fay (2005) and there was a huge change from very low levels to much higher levels in the longspine reconstructed catch series. The STAR agreed with STAT after two runs of comparisons and discussions on the possible reasons. Although the estimated SSB is less sensitive to these earlier catches, continued effort to investigate the historical catch reconstruction is still helpful in improving the stock assessment.

There are no age data in the stock assessment model. Future investigation of ageing methods and extra age information should help improve the stock assessment.

4.2.3 *ToR 3* – Evaluate model assumptions, estimates, and major sources of uncertainty.

A fixed stock-recruit steepness, h, was used in the base model. There were intensive discussions on whether the mean of the prior based on Thorson (2013) should be used. Given the reality that thornyheads are not rockfishes the STAR suggested that h=0.6 used in the 2005 stock assessment continue to be used. This suggestion is consistent with the suggestion to the shortspine thornyhead team. The natural mortality rate was further updated based on the mean of the prior developed from Hamel (2013). Different values of these two parameters have dramatic influence on the stock assessment results. I considered this as one major source of uncertainty in estimating the fishery and stock status.

The catch is assumed to be deterministic without uncertainty but at the same time pre-1981 historical catch was one of the major uncertainties discussed during the review. So, beyond continued effort on historical data reconstruction/ synthesis, measuring and incorporating uncertainty of catch in the model should probably to be explored.

Estimation uncertainty seems high for this stock because the scale of the population size changed dramatically with limited changes on the model or data structure. This could be because of the lack of intensive jittering in a short while. At the same time, it could be because of the overall scale of the population size is less estimable.

The current axis on the decision table is based on $\ln(R_0)$. Both natural mortality and steepness are also of high uncertainty. The current decision analysis is not enough to indicate states of nature, but the STAR panel cannot provide better

suggestions given the current estimation algorithm (likelihood based). A full Bayesian analysis would make this step much easier and more scientific.

4.2.4 *ToR 4* – Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.

Uncertainty of the historical catch is one of the major uncertainties for many species along the Pacific Coast. For longspine thornyhead, some sensitivity runs with a reasonable level of uncertainty on historical catch may help. In addition to continued effort on historical data reconstruction/synthesis, incorporating uncertainty of catch in the model should probably be explored instead of assuming no error in the model. The catch history reconstructed seems very unusual; some special effort is needed to figure out the reasons for this for both longspine and shortspine thornyhead.

Studies on catchability may be further developed from both the field experiment studies and modeling prior elicitations. This should help improve the robustness of the model results, such as the scale of SSB.

I suggest that continued effort should be spent on the development of a full Bayesian analysis given my concerns in ToRs. The results from such an analysis should be readily used in a decision table, and uncertainty considered is based on all sources of the uncertainty involved in the model instead of only on natural mortality or steepness. Informative priors on key life history or fishery related parameters can also be incorporated in such an analysis.

4.2.5 *ToR 5* – Determine whether the science reviewed is considered to be the best scientific information available.

I consider the assessment represents the best scientific information available for the stock assessment of longspine thornyhead. The panel endorsed the base case model as the best available science for use in determining stock status and management decisions.

4.2.6 *ToR 6* – When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

Suggestions for short-term improvement include 1) collect biological sampling data, such as maturity, fecundity and growth more frequently given the concern on its possible variation across time and space (a couple of years here) if possible to validate the functions, 2) continue the effort on catch data reconstruction and update, and 3) explore other ageing method and continue the effort in ageing the existing datasets and future data.

Suggestions for long-term improvement are mainly on the possible approaches to increase model stability/robustness by considering 1) simpler models that may provide relatively robust advice and 2) studies on catchability of the surveys that may be further developed from both the field experiment studies and modeling prior elicitations. I also suggest that continuing effort be spent to develop a full Bayesian analysis.

4.2.7 *ToR 7* – Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

The STAT team for longspine thornyhead stock assessment, Drs. Andi Stephens and Ian Taylor started their presentations on the draft stock assessment on Tuesday morning, July 23. The presentation and discussion extended for most of the day. During their presentations, questions were asked from the STAR instead of waiting until the end of the presentation. The presentations were prepared according to biological and geographic characteristics of longspine thornyhead, previous stock assessments and declared fishery/stock status from historical stock assessments, data (including data synthesis) and models structured (base case and sensitivity runs), and then model results. Questions were asked throughout the presentations by the STAR panel. The request from the STAR panel and the responses from the STAT team can be found from the STAR panel report. Overall the discussions were mainly on the details of the historical catch data, use of fixed growth parameters, selectivity curves and time blocks on the time varying retention curves, and the appropriate axis of uncertainty for the decision table. Because this stock assessment was presented after the one for shortspine thornyhead and there are similarities between the two stock assessments, so time on this stock assessment was relatively shorter than on that for shortspine thornyhead. The STAR recommended a few changes to STAT's proposed base model in the draft stock assessment after multiple sensitivity runs. Below, I list the major pertinent discussions and recommendations.

Questions on the unusual growth parameterization:

Why are the growth variations of male and females different since they're assumed to be the same? Is it reasonable for the growth curves given the fixed k and L_A_{max} did not reach asymptote till age 40?

The discussion on this issue was very useful. The STAT team fixed the mis-specification of offset of the male growth variation. The STAT team also released the fixed k by estimating it based on the suggestions from the STAR. The modification to the model improved the model fit dramatically. This modification of the growth curve was adopted into the new base case model.

Questions on unusual catch history of the pre-1981 reconstructed catch:

Uncertainty about the catch history was discussed in the draft document and during the review. The historical catch of longspine thornyhead is uncertain prior to 1981 when PacFIN database was started. The STAT used the historical catch time series from the Fay (2005) assessment rather than the reconstructed catches. The STAR requested a comparison between the catch time series used in Fay (2005) and the reconstructed catch history. The extremely low catches in early years in the reconstructed catch is hard to explain, so both the STAR and STAT agreed to continue to use the pre-1981 catch time series used in Fay (2005). However, STAR also suggested that further exploration on the reconstructed catch is needed.

Questions on the selectivity functions when selectivities were estimated to be asymptotic:

The STAT team estimated the selectivities for all the fishery and surveys by assuming them to be double normal and then fixed some of the parameters to let the selectivity patterns to be asymptotic if there were little support for the assumption of double normal. The STAR panel suggested that logistic selectivity functions for two NWFSC surveys and the fishery be used as a sensitivity run (keep double normal for AFSC slope survey). The selectivities changed from the original base case and the catchabilities for the surveys decreased. The STAR and STAT agreed with the change in the selectivity functions for the NWFSC surveys and the fishery and adopted this revision in the new base case.

On July 22, STAR panel member Dr. Meisha Key questioned the time blocks used in the time varying retention curves for shortspine thornyhead. This question was apparently appropriate to longspine thornyhead since both species used the same time blocks in their original draft reports. Based on the advice from the GAP and GMT, another four sensitivity runs were requested by STAR. After intensive comparison with both model goodness of fit and the historical fishery reality, the new time blocks agreed by both the STAT and STAR and adopted in the new base case model for the fishery are: 1901-1991, 1992-2006, 2007-2010, from 2011 onward.

Extra explorations and discussions on model fitting included: fit to the observation data of length composition and relative abundance indices, Pearson residual plot for length composition, likelihood from each dataset given different sensitivity runs, jittering and likelihood profiles, and retrospective analyses. The exploration and discussion went very well, and I found them to be useful and contribute to the overall success of the stock assessment review.

There were two runs of requests from July 25 and 26 on the approaches to quantify the uncertain state of nature in the decision table. Because the model output was based on a likelihood paradigm, and both natural mortality and steepness were fixed, the likelihood profile given different Ms were flat. M=0.6

resulted in a likelihood profile of the lowest position, and the STAT panel felt this did not reflect the life history of longspine thornyhead according to the maximum age observed, so suggested not to use it to estimate M and not to use it to bracket uncertainty. The profile of h was provided also on Friday morning and h reached 1 for the best estimate. $Ln(R_0)$ likelihood profile was provided, and the results indicated that this parameter is more appropriate to be used to bracket uncertainty. The STAT then proposed by using the corresponding $Ln(R_0)$ from 12.5% SSB to represent the lower state of nature, and used the $(Ln(R_0)|_{12.5\%SSB})$-$Ln(R_0)|_{50\%SSB})$ to get the high nature of $Ln(R_0)$. I personally strongly recommend a full Bayesian analysis to address the state of nature in the decision table.

5. SUGGESTIONS FOR IMPROVEMENTS OF NMFS REVIEW PROCESS AND PRODUCTS

The current review process is very well designed. I consider the review proceedings and discussions effective and I believe that they will improve the stock assessment in the future. The review can be further improved if the presentations used in the review meeting can be distributed to the STAR panel a few days earlier before the meeting, if the agenda can be enforced to a degree, and if a follow-up review can be conducted in the near future. A systematic sensitivity analysis will further help our understanding of these stocks. The STAR review and discussion should be implemented more effectively by this extra follow-up review.

6. Acknowledgements

I would like to thank all the Stock Assessment Team members contributing to the meeting for their informative presentations on the stock assessments of these two species and for providing helpful and patient responses to the review panel's questions. Many thanks also to the Panel Advisors and observers at the meeting for their contribution to the discussions throughout the meeting. Special thanks also go to the other members of the review panel for productive discussions on the assessments.

7. References

Fay, G. 2005. Stock Assessment and Status of Longspine Thornyhead (*Sebastolobus altivelis*) off California, Oregon and Washington in 2005.

Hamel, O.S. 2013. Development of prediction intervals and priors for the natural mortality rate using multiple meta-analyses using life-history correlates. DRAFT for Data Moderate Assessment Review, April 2013.

Hamel. O.S. 2005. Status and future prospects for the shortspine thornyhead resource in waters off Washington, Oregon, and California as assessed in 2005.

Pacific Fishery Management Council. 2012. Terms of Reference for the Groundfish and Coastal Pelagic Species Stock Assessment and Review Process for 2013-2014.

Pearson, K.E., and D.R. Gunderson. 2003. Reproductive biology and ecology of shortspine thornyhead rockfish, *Sebastolobus alascanus* and longspine thornyhead rockfish, *S. altivelis*, from the northeaster Pacific Ocean. Env. Biol. Fish. 62:117-136.

Punt, A., and Hilborn, R. 1997. Fisheries stock assessment and decision analysis: the Bayesian approach. Reviews in Fish Biology and Fisheries. 7: 35-63.

Thorson. J. 2013. Estimating a Bayesian prior for steepness in Pacific rockfishes (*Sebastes spp.)* off the U.S. West Coast for the 2013 assessment cycle. Draft.

Appendix 1: Bibliography of Materials Provided for Review

Draft Stock Assessment Documents:

Taylor, I. and Stephens, A. 2013. Stock Assessment of Shortspine Thornyhead in 2013. Pre-STAR DRAFT.

Stephens, A. and Taylor. I. 2013. Stock Assessment and Status of Longspine Thornyhead (*Sebastolobus altivelis*) off California, Oregon and Washington in 2013. Pre-STAR DRAFT.

Previous Thornyhead Stock Assessments

Fay, G. 2005. Stock Assessment and Status of Longspine Thornyhead (*Sebastolobus altivelis*) off California, Oregon and Washington in 2005.

Hamel. O.W. 2005. Status and Future Prospects for the Shortspine Thornyhead Resource in Waters off Washington, Oregon, and California as Assessed in 2005.

Background Materials:

Hamel, O.S. 2013. Development of prediction intervals and priors for the natural mortality rate using multiple meta-analyses using life-history correlates. NOAA Fisheries, Northwest Fisheries Science Center, Seattle. 4/28/2013.

Karnowski, M., Gertseva, V. and Stephens, A. 2012. Historical Reconstruction of Oregon's Commercial Fisheries Landings. September, 2012.

NWFSC Observer Program (a.k.a.WCGOP). Data Products for Stock Assessment Authors. *Jan. 2013.*

Ralston, S., Pearson, D., Field, J., and Key, M. 2009. Documentation of the California Catch Reconstruction Project. April 20, 2009.

Stewart, I.J. and Hamel, O.W. *In press*. Bootstrapping to inform effective sample sizes for length- or age-composition data used in stock assessments.

Thorson, J.T. and Ward, E. Accounting for space-time interactions in index standardization models.

Thorson. J. 2013. Estimating a Bayesian prior for steepness in Pacific rockfishes (*Sebastes* spp.) off the U.S. West Coast for the 2013 assessment cycle. April 1, 2013.

Wallace, J.R. 2013. DRAFT -Applying the U.S. West Coast's First Major Trawl Bycatch and Mesh Size Studies to Fishery data using Post-hoc Fishing Strategies and Geographical Area.

Stock Synthesis Model-Related Documents

Methot, R.D. 2012. Stock Synthesis User Manual. NOAA Fisheries, Seattle, WA.

Methot, R.D. 2012. Stock Synthesis Technical Description. NOAA Fisheries, Seattle, WA.

Additional Materials Provided During the Panel:

Francis, R.J.C.C. 2011. Data weighting in statistical fisheries stock assessment models. Can. J. Fish. Aquat. Sci. 68: 1124–1138.

Pearson, K.E., and D.R. Gunderson. 2003. Reproductive biology and ecology of shortspine thornyhead rockfish, *Sebastolobus alascanus* and longspine thornyhead rockfish, *S. altivelis*, from the northeaster Pacific Ocean. Env. Biol. Fish. 62:117-136.

Appendix 2: Statement of Work for Dr. Yan Jiao

External Independent Peer Review by the Center for Independent Experts

Stock Assessment Review (STAR) Panel for Longspine and Shortspine Thornyheads

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description: Benchmark assessments will be conducted for longspine thornyhead and shortspine thornyhead. Both species are long-lived and are major targets of the slope trawl fishery. In addition, these species were last assessed in 2005 and therefore no longer considered "adequate" as defined by NMFS HQ's S/T office. Additionally, landings of each have climbed since their last assessments, as fishing effort has been diverted from shelf to deeper slope depths, in order to promote rebuilding of depleted species.

Assessments for these two stocks will provide the basis for the management of the groundfish fisheries off the West Coast of the U.S. including providing scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The technical review will take place during a formal, public, multiple-day meeting of fishery stock assessment experts. Participation of external, independent reviewer is an essential part of the review process. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Two CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. One of the CIE reviewers will participate in all STAR panels held in 2013 to provide a level of consistency between the STAR panels. The CIE reviewers shall be active and engaged participants throughout panel discussions and able to voice concerns, suggestions, and

improvements while respectfully interacting with other review panel members, advisors, and stock assessment technical teams. The CIE reviewers shall have excellent communication skills in addition to working knowledge and recent experience in fish population dynamics, with experience in the integrated analysis modeling approach, using age-and size-structured models, use of MCMC to develop confidence intervals, and use of Generalized Linear Models in stock assessment models. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Seattle, Washington during the dates of 22-26, July 2013.

Statement of Tasks: Each CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/sponsor.html).

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in

accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.
Documents to be provided to the CIE reviewers prior to the STAR Panel meeting include:

- The current draft stock assessment reports;
- Previous stock assessments and STAR panel review reports of shortspine and longspine thornyheads;
- The Pacific Fishery Management Council's Scientific and Statistical Committee's Terms of Reference for Stock Assessments and STAR Panel Reviews;
- Stock Synthesis (SS) Documentation
- Additional supporting documents as available.
- An electronic copy of the data, the parameters, and the model used for the assessments (if requested by reviewer).

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. Each CIE reviewer is not required to reach a consensus, and should provide a brief summary of the reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting in Seattle, Washington during the dates of 22-26 July, 2013 as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than 9 August 2013, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and to Dr. David Die, CIE Regional Coordinator, via email to ddie@rsmas.miami.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

June 17, 2013	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
July 8, 2013	NMFS Project Contact sends the CIE Reviewers the pre-review documents
July 22-26, 2013	Each reviewer participates and conducts an independent peer review during the panel review meeting
August 9, 2013	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
August 23, 2013	CIE submits CIE independent peer review reports to the COR
August 30, 2013	The COR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering

Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) each CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) each CIE report shall address each ToR as specified in **Annex 2**,
(3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Program Manager, COTR
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Roger W. Peretti, Executive Vice President
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Key Personnel:

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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

Stock Assessment Review (STAR) Panel for Longspine and Shortspine Thornyheads

1. Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.
2. Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.
3. Evaluate model assumptions, estimates, and major sources of uncertainty.
4. Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.
5. Determine whether the science reviewed is considered to be the best scientific information available.
6. When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.
7. Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

Appendix 3: Panel Membership or other pertinent information from the panel review meeting

Participants
Stock Assessment Review Panel for
Longspine Thornyhead and Shortspine Thornyhead

NOAA Fisheries, Northwest Fisheries Science Center
Auditorium
2725 Montlake Blvd. E
Seattle, Washington 98112
July 22 – 26th, 2013

Technical Reviewers

Meisha Key, Scientific and Statistical Committee (SSC), Panel Chair
Yan Jiao, Center for Independent Experts (CIE)
Jean Jacques Maguire, Center for Independent Experts (CIE)
Ray Conser, Fish Stock Assessment Consulting

Panel Advisors

John DeVore, Pacific Fishery Management Council (PFMC), Staff Officer
Dan Erickson PFMC Groundfish Management Team (GMT)
Gerry Richter, PFMC Groundfish Advisory Subpanel (GAP)
Pete Leipzig, PFMC Groundfish Advisory Subpanel (GAP) Alternate

Stock Assessment Teams (STATs)

Shortspine Thornyhead STAT

Ian Taylor, Northwest Fisheries Science Center (NWFSC)
Andi Stephens, Northwest Fisheries Science Center (NWFSC)

Lonsgpine Thornyhead STAT

Andi Stephens, Northwest Fisheries Science Center (NWFSC)
Ian Taylor, Northwest Fisheries Science Center (NWFSC)

Appendix 4: Agenda - Stock Assessment Review (STAR) Panel for Longspine Thornyhead and Shortspine Thornyhead

NOAA Fisheries, Northwest Fisheries Science Center
Auditorium
2725 Montlake Blvd. E
Seattle, Washington 98112

July 22 – 26th, 2013

Monday, July 22, 2013

8:30 a.m. Welcome and Introductions

9:15 a.m. Review the Draft Agenda & Discuss Meeting Format (M. Key, Chair)
- Review Terms of Reference (TOR) for assessments and STAR panel
- Assign reporting duties
- Discuss and agree to format for the final assessment document
- Agree on time and method for accepting public comments

9:30 a.m. Presentation of Shortspine Thornyhead (SST) Assessment (I. Taylor)
- Overview of data and modeling

12:30 p.m. Lunch (On Your Own)

1:30 p.m. Q&A session with SST-STAT

STAR Panel discussion
- Panel develops written request for additional model runs / analyses

3:30 p.m. Presentation of Longspine Thornyhead (LST) Assessment (A. Stephens) (if time allows)
- Overview of data and modeling

5:30 p.m. Adjourn for Day.

Tuesday, July 23 2013

8:30 a.m. Continue Presentation of LST Assessment (A. Stephens)
- Overview of data and modeling

12:00 p.m. Lunch (On Your Own)

1:30 p.m. Q&A Session with LST-STAT

Panel Discussion
- Panel develops written request for additional model runs / analyses

4:30 p.m. Check in with SST-STAT

5:30 p.m. Adjourn for Day.

Wednesday, July 24 2013

8:30 a.m. Presentation of First Set of Model Runs for SST (I. Taylor)
- Q&A session with the SST- STAT & Panel discussion
- Panel develops written request for second round of model runs / analyses for SST-STAT

12:00 p.m. Lunch (On Your Own)

1:30 p.m. Presentation of First Set of Model Runs for LST (A. Stephens)

- Q&A session with STAT & Panel discussion
- Panel develops written request for second round of model runs / analyses for STAT.

5:30 p.m. Adjourn for day.

Thursday, July 25, 2013

8:30 a.m. Presentation of Second Set of Model Runs for SST (I. Taylor)

- Q&A session with the SST -STAT & Panel discussion
- Agreement of preferred model and model runs for decision table
- Panel continues drafting STAR report.

12:00 p.m. Lunch (On Your Own)

1:00 p.m. Presentation of Second Set of Model Runs for LST (A. Stephens)

- Q&A session with the LST-STAT & Panel discussion
- Agreement of preferred model and model runs for decision table
- Panel continues drafting STAR report.

4:00 p.m. Continue Panel Discussion or Drafting STAR Panel Report

5:30 p.m. Adjourn for day.

Friday, July 26, 2013

8:30 a.m. Consideration of Remaining Issues

- Review decision tables for assessments

10:00 a.m. Panel Report Drafting Session

12:00 p.m. Lunch (on your own)

2:00 p.m. Review First Draft of STAR Panel Report

4:00 p.m. Panel Agrees to Process for Completing Final STAR Report by Council's September Meeting Briefing Book Deadline (Date TBD)

5:30 p.m. Review Panel Adjourn.